

LARC CHARACTER CODES

CONSOLE DECIMAL DISPLAY	NUMERIC ONE DIGIT	ALPHA TWO DIGIT	CONSOLE KEYBOARD
0	11100	15	\
0	00100	16	^
-	00010	17	-
0	10000	20	0
1	00001	21	1
2	10011	22	2
3	00111	23	3
4	10110	24	4
5	01000	25	5
6	11001	26	6
7	01011	27	7
8	11111	28	8
9	01110	29	9
8	11010	37	.
+	10101	80	+
	01101	illegal	

INSTRUCTION WORD FORMAT

T	I	I	A	A	B	B	M	M	M	M	M
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- T :** 1-9 = TRACING MODE
 . = NO TRACING MODE
 i = INDIRECT ADDRESSING MODE
I : INSTRUCTION DIGITS
A : ARITHMETIC REGISTER ADDRESS
B : INDEX REGISTER ADDRESS
M : STORAGE ADDRESS

Univac®
LARC

INSTRUCTION
CARDS

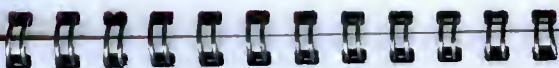
COMPUTING UNIT INSTRUCTIONS

00	SKP	Skip	
01	AX	$(M) + (A)$	$\rightarrow A$
02	A	$(M) \oplus (A)$	$\rightarrow A$
03	AM	$ (M) \oplus (A)$	$\rightarrow A$
04	AU	$(M) \oplus (A)$	$\rightarrow A + 1$
05	AAX	$(M') + (A')$	$\rightarrow A'$
06	AA	$(M') \oplus (A')$	$\rightarrow A'$
09	FV	Lock Yes: (5DD)	$\rightarrow A$, Reset Lock & Connect
		Set? No: M	$\rightarrow C$
11	NX	$-(M) + (A)$	$\rightarrow A$
12	N	$-(M) \oplus (A)$	$\rightarrow A$
14	NU	$-(M) \oplus (A)$	$\rightarrow A + 1$
15	NNX	$-(M') + (A')$	$\rightarrow A'$
16	NN	$-(M') \oplus (A')$	$\rightarrow A'$
19	FVK	Lock Yes: (12DD)	$\rightarrow A$, Reset Lock & Connect
		Set? No: M	$\rightarrow C$
20	MXR	$(M) \times (A) Rdd$	$\rightarrow A$
21	MXE	$(M) \times (A)$	$\rightarrow A'$
22	MR	$(M) \otimes (A) Rdd$	$\rightarrow A$
23	M	$(M) \otimes (A)$	$\rightarrow A$
24	MU	$(M) \otimes (A)$	$\rightarrow A + 1$
25	ME	$(M) \otimes (A)$	$\rightarrow A'$
26	MMX	$(M') \times (A')$	$\rightarrow A'$
27	MM	$(M') \otimes (A')$	$\rightarrow A'$
29	SV	Lock Yes: M	$\rightarrow C$
		Set? No: (A)	$\rightarrow 5DD$
30	DX	$(A) \div (M)$	$\rightarrow A$
31	DXE	$(A) \div (M)$	$\rightarrow A, A + 1$ [Remoinder]
32	DR	$(A) \oplus (M) Rdd$	$\rightarrow A$
34	DUR	$(A) \oplus (M) Rdd$	$\rightarrow A + 1$
35	DDX	$(A') \div (M')$	$\rightarrow A'$
36	DD	$(A') \oplus (M')$	$\rightarrow A'$
37	DSE	$(A') \oplus (M)$	$\rightarrow A'$
39	SVK	Lock Yes: M	$\rightarrow C$
		Set? No: (A)	$\rightarrow 12DD$
40	S	(A)	$\rightarrow M$
41	SN	$-(A)$	$\rightarrow M$
42	SM	$ (A) $	$\rightarrow M$
43	F	(M)	$\rightarrow A$
45	SS	(A')	$\rightarrow M'$
46	SSN	$-(A')$	$\rightarrow M'$
47	SSM	$ (A') $	$\rightarrow M'$
48	FF	(M')	$\rightarrow A'$
50	CX	FL	$\rightarrow FX, M = scale$

51	C	FX	$\rightarrow FL, M = scale$
52	PR	$(A) 10^{-M}$	$\rightarrow A, M places$
53	PL	$(A) 10^M$	$\rightarrow A, M places$
55	CCX	FL'	$\rightarrow FX', M = scale$
56	CC	FX'	$\rightarrow FL', M = scale$
57	PPR	$(A') 10^{-M}$	$\rightarrow A', M places$
58	PPL	$(A') 10^M$	$\rightarrow A', M places$
59	PPC	Left circular shift	$M places$
60	EOP	(M_i)	$\rightarrow A_i$
61	EA	(M_A)	$\rightarrow A_A$
62	EB	(M_B)	$\rightarrow A_B$
63	EAB	(M_{AB})	$\rightarrow A_{AB}$
64	EM	(M_M)	$\rightarrow A_M$
65	EL	Ext. into A from A - 1 according to M	
66	EU	Ext. into A from A + 1 according to M	
70	TE	(A) = Yes: M	$\rightarrow C$
		(A + 1) No: (C) + 1	$\rightarrow C$
71	TG	(A) > Yes: M	$\rightarrow C$
		(A + 1) No: (C) + 1	$\rightarrow C$
72	TZ	(A) = Yes: M	$\rightarrow C$
		Zero No: (C) + 1	$\rightarrow C$
73	TGZ	(A) > Yes: M	$\rightarrow C$
		Zero No: (C) + 1	$\rightarrow C$
74	TLX	(A) < Yes: M	$\rightarrow C$
		Zero No: (C) + 1	$\rightarrow C$
75	TTE	(A') = Yes: M	$\rightarrow C$
		(A + 2)' No: (C) + 1	$\rightarrow C$
76	TTG	(A') > Yes: M	$\rightarrow C$
		(A + 2)' No: (C) + 1	$\rightarrow C$
80	BIT	$N - 1 \rightarrow N$ [N = 0] Yes: (C) + 1	$\rightarrow C$
		$\Delta + D \rightarrow \Delta$ No: M	$\rightarrow C$
81	BDT	$N - 1 \rightarrow N$ [N = 0] Yes: (C) + 1	$\rightarrow C$
		$\Delta - D \rightarrow \Delta$ No: M	$\rightarrow C$
82	BIC	$N - 1 \rightarrow N$ [N = 0] Yes: M	$\rightarrow C$
		$\Delta + D \rightarrow \Delta$ No: (C) + 1	$\rightarrow C$
83	BDC	$N - 1 \rightarrow N$ [N = 0] Yes: M	$\rightarrow C$
		$\Delta - D \rightarrow \Delta$ No: (C) + 1	$\rightarrow C$
85	BI	$\Delta + D$	$\rightarrow \Delta$
86	BD	$\Delta - D$	$\rightarrow \Delta$
90	T	M	$\rightarrow C$
91	TR	$990(C) + 1$	$\rightarrow M, M + 1 \rightarrow C$
92	TB	(C)	$\rightarrow A, M \rightarrow C$
93	SLJ	(C2)	$\rightarrow M$ [990 $\rightarrow C2 \rightarrow M$ or 0 $\rightarrow C2 \rightarrow A$]
95	TF	FF A Yes: M	$\rightarrow C$
		Set? No: (C) + 1	$\rightarrow C$
96	RF	Reset FF A	
97	SF	Set FF A	
99	H	Stop	

FLIP-FLOPS

NUMBER	CONSOLE DESIGNATION	NAME
00-09	0-9	Sense
10	OIS	Oisclosure
11	IOP	Processor Intervention †
15	II	Manual and IOP Intervention Inhibit
20	TM	Enter Tracing Mode ‡
21-29	1-9	Tracing Mode
30-34	0-4	Computing Unit Manual Intervention †
38	TAPE	Improper Paper Tape ‡
39	AOO	Improper Operand †
40	ZERO	Zero floating point adder result †
41	OIV	Non-normalized divisor †
42	EX †	Exponent overflow †
43	EX †	Exponent underflow †
44	OF	Fixed decimal overflow †
45	SGN	Sign anomaly †
46	STALL	Stall ‡
47	MISC	Control Error ‡
48	RES	A-register control error on result time ‡
49	OEC	Decoding error on tracing digit ‡
50	CALL	B-adder error to memory address decoder ‡
51	IOE	Instruction error ‡
52	OOE	Operand error ‡
53	B	A-register error on B-modification ‡
54	M	A-register error on M-slot ‡
55	W	A-register error on result time ‡
56	C1	B-adder error to C1, HSB, or AU ‡
57	IR2	B-adder error to A-storage, A-selector, or M of IR2 ‡
58	C2	B-adder error to C2
59	AB	AB-adder error ‡



60	AS-	AS-register error ‡
61	COMP	Comparator error ‡
62	QIE	Multiplier, quotient, or extraction error ‡
63	SFC	Shift controls error ‡
64	OF	Overflow error ‡
65	PC	Program counter or decoding error ‡
66	EP	Ending pulse error ‡
67	AH	AH-register error ‡
68	AD	AO-register error ‡
69	SGN	Sign position error ‡
70	A	A-register error on A-slot ‡
71	1	Oigit #1 error
72	2	Oigit #2 error
73	3	Oigit #3 error
74	4	Oigit #4 error
75	5	Oigit #5 error
76	6	Digit #6 error
77	7	Oigit #7 error
78	8	Oigit #8 error
79	9	Oigit #9 error
80	10	Oigit #10 error
81	11	Oigit #11 error
82	12	Oigit #12 error
84	CY	Cycling unit error
90	R (on Flex)	Start paper tape
98	Master Check	Master error ‡
99	Master Contingency	Master contingency ‡

NOTE: † Contingency Flip Flop
‡ Error Flip Flop

RULES FOR SIGN POSITION

I. STORE INSTRUCTIONS: SM, SN, SSN

LEGEND:

$A+2, A+3$
OR $M, M+1$

$A, A+1$ DOUBLE PRECISION

TRANSFER AFTER TEST
 NO TRANSFER AFTER TEST
 CONTINGENCY-FF 45**
 11 11-DIGIT COMPARISON
 12 12-DIGIT COMPARISON
 S SIGN IS CALCULATED
 N: NUMERIC
 \bar{N} : NON-NUMERIC

SM

O	O
-	O
.	O
N	O
\bar{N}	O

SN, SSN*

O	-
-	O
.	.
N	
\bar{N}	

** WHEN SIGN CONTINGENCY OCCURS A ZERO \rightarrow S
 * SIGN OF EACH HALF IS HANDLED SEPARATELY.

II. EQUALITY & MAGNITUDE TESTS: TE, TTE, TZ, TGZ, TLZ, TG, TTG

TE, TTE*
 $A+1$

	O	-	.	N	\bar{N}
O	11		11		
-		11			
.	11		11		
N				12	
\bar{N}					

TGZ

A	
O	11
-	
.	11
N	
\bar{N}	

TLZ

A	
O	
-	
.	
N	
\bar{N}	

TG, TTG*
 $A+1$

	O	-	.	N	\bar{N}
O	11		11		
-		11			
.	11		11		
N				12	
\bar{N}					

TZ

A	
O	11
-	11
.	11
N	
\bar{N}	

III. ARITHMETIC INSTRUCTIONS: FIXED AND FLOATING POINT

1. AOO AND SUBTRACT: AX, AM, NX, A, AU, AAX, AA, N, NU, NNX, NN

AX
M

	O	-	.	N	\bar{N}
O	O	S	O	N	
-	S	-	-	N	
.	O	-	.	N	
N	N	N	N	N	
\bar{N}					

AM
M

	O	-	.	N	\bar{N}
O	O	O	O	O	O
-	S	S	S	S	S
.	O	O	O	O	O
N					
\bar{N}					

NX
M

	O	-	.	N	\bar{N}
O	S	O	O	N	
-	-	S	-	N	
.	-	O	.	N	
N	N	N	N	N	
\bar{N}					

A, AU, AAX, AA
M

	O	-	.	N	\bar{N}
O	O	S	O		
-	S	-	-		
.	O	-	.		
N					
\bar{N}					

N, NU, NNX, NN
M

	O	-	.	N	\bar{N}
O	S	O	O		
-	-	S	-		
.	-	O	.		
N					
\bar{N}					

2. MULTIPLY AND DIVIDE:

MXR, MXE, MR, M, MU, ME, MMX, MM, OX, OXE, OR, OUR, OOX, OO, OSE

M

	O	-	.	N	\bar{N}
O	O	-	.		
-	-	O	.		
.	.	.	.		
N					
\bar{N}					

IN MM & MMX THE SIGN OF THE LEAST SIGNIFICANT HALF IS USED.